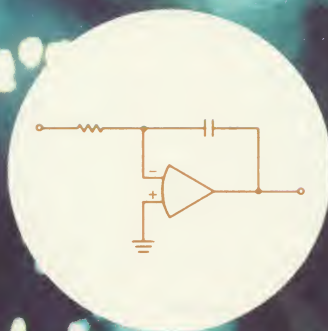
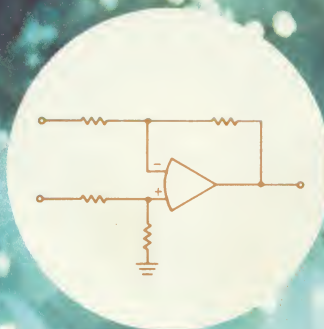
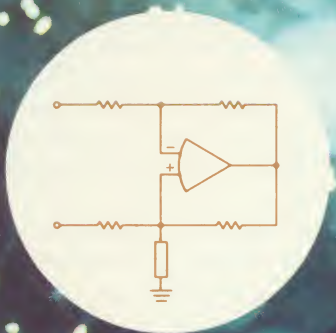




ZELTEX, INC.

SOLID STATE OPERATIONAL AMPLIFIERS • CONDENSED CATALOG



in just a few long years ...

Founded in 1962, Zeltex opened the doors with a full capability for the development and volume production of high performance amplifiers for the computer and instrumentation fields. During these years, years comprised of long days and long weeks, Zeltex has grown into a position of prominence as a manufacturer of high quality solid state devices.

Zeltex was founded on the belief that people are the key to the design and production of advanced components in a swiftly changing technology. From the outset, key personnel in research, manufacturing and administration organized to develop what is now the industry's broadest line of operational amplifiers and analog computer elements.

Some significant Zeltex firsts include: the first chopper stabilized differential amplifiers employing transistors rather than vacuum tubes, the first 100 volt solid state differential amplifier, and the first production differential operational amplifier to use field effect transistors for high input impedance and low input current. At Zeltex, competitive pricing is recognized to be as important as reliability and technical sophistication; the Model 140B is the industry's first 100 volt solid state amplifier to be available at vacuum tube prices.

Also in the comprehensive Zeltex line are: low cost differential amplifiers, an entire family of sophisticated chopper stabilized differentials, a variety of single ended stabilized amplifiers, and a series designed especially for application in analog computers and flight simulators.

and tomorrow?

Today, solid state technology is undergoing a major revolution comparable to that created with the advent of the transistor. A host of new and exciting devices is emerging from the laboratory ready for industrial use. Even more significant, the technology of grown circuits and thin film construction is rapidly reaching the point where non-military application of reliable subsystems is financially justified. □ Zeltex management is fully committed to the philosophy that continued research in product design and application is fundamental to manufacturing the finest and most sophisticated solid state amplifiers. The standard amplifiers shown in this brochure are continually being improved and augmented with new designs. □ The experience of the Zeltex engineering and management team rests in analog computer technology. The operational amplifiers presented here represent the initial step in a program of planned product expansion. The recent introduction of the Zeltex 500 series electronic quarter square multipliers reflects our determination to provide the industry with a new class of precise analog computer elements. Product expansion in computer elements and special purpose computer systems will be accelerated in the immediate future. We invite you to keep abreast with the new Zeltex developments by completing and returning the enclosed self-addressed reply card.

Reliability must be built into the product at every step...

Quality has continued to be a prime consideration in Zeltex designs and production methods. To reflect true reliability in the end product, it is essential to stress quality in engineering and production and then to thoroughly check the product in final test.

Zeltex engineering is continually investigating new components and design techniques. The decision of whether or not to use a new exotic component is often tempered by an awareness of the strict reliability requirements born from experience with basic component failure rates under extensive environmental testing.

All phases of manufacturing are under the close scrutiny of the Zeltex Quality Control Program. Highest reliability components are used wherever possible. All circuitry is hand soldered on MIL grade glass-epoxy etched circuit cards. Most components are of the MIL type. Where new devices have not yet been MIL approved, they are accepted only where the manufacturer can supply certification that construction is in compliance with MIL requirements.

Testing is in full compliance with MIL-Q-9858 whether the amplifiers are destined for military use or not. All amplifiers are baked and aged before final test. Every amplifier is fully tested under temperature prior to shipment. A complete test record is kept on file at the factory for each amplifier, and a copy is included with the amplifier at time of shipment. Government or company source inspection is welcomed where desired.

a word about specials...

The amplifiers shown on the next four pages are standard Zeltex designs which are continually manufactured in regularly scheduled production lots. In addition to the standard units, Zeltex has engineered and produced over 100 different types for special applications. Most of these were created by the "specials team" who were organized for quick reaction to custom requirements. If you need a modification of a standard design or a special design, contact the Zeltex Sales Department; perhaps your amplifier has been partially or completely designed for one of our other customers.

Most of these custom designs fall into the more popular categories listed below.

1. Increased output range of current or voltage.
2. Modification for different power supply levels.
3. Altered card size, connector type or packaging configuration.
4. Electrical design and packaging to MIL specifications (including shipboard, airborne or fire control specs and environments).
5. Increased high frequency gain with tailored marginal stability.
6. Exceptionally fast slew rate and settling time for conversion systems.

In addition, Zeltex design and applications engineers are particularly experienced in these two areas:

1. Amplifier applications; synthesis of custom transfer functions, active filtering, voltage to current conversion, special function generation, sample hold circuitry and other fast switching applications.
2. Analog systems; special purpose analog computers and simulators, digital and iterative control of analog systems, solid state computing elements for special or general purpose analog computers.

Comprehensive environmental tests over temperature range comply with MIL-Q-5898.



On-line inspection is performed for each step.



All amplifiers are aged for 100 hours for drift stabilization.



SINGLE ENDED AMPLIFIERS

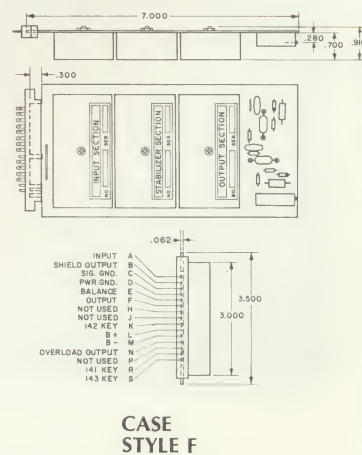
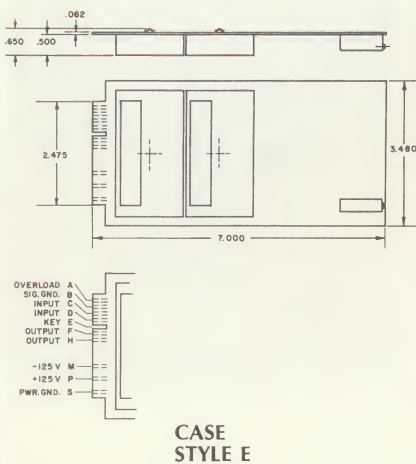
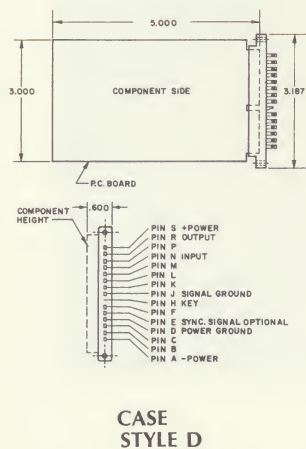
a word about the ZELTEX single ended amplifiers...

The amplifiers tabulated below are all single input, single output (inverting) types. All versions use silicon semiconductors exclusively and employ FET choppers. All units are short circuit protected. In all cases, wideband noise is

measured with the amplifier connected as a unity inverter to reflect the true noise level over the full bandwidth. Mating connectors are supplied with all amplifiers at no increase in cost.

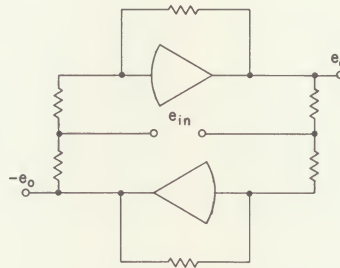
CHARACTERISTICS (@ 25° C unless noted)	1. OPEN LOOP GAIN AT D.C. 2. GAIN BANDWIDTH PRODUCT (at unity gain) 3. INPUT IMPEDANCE (at D.C.) 4. OFFSET VOLTAGE ADJUSTMENT 5. INPUT VOLTAGE DRIFT vs TEMP. 6. INPUT VOLTAGE DRIFT vs TIME (Constant Temp.) 7. INPUT OFFSET CURRENT 8. INPUT CURRENT DRIFT vs TEMP. 9. INPUT NOISE, NARROW BAND (2 cps to 20 cps) 10. INPUT NOISE, WIDE BAND (2 cps to 1 mc) 11. OUTPUT VOLTAGE 12. OUTPUT CURRENT 13. FREQUENCY FOR FULL OUTPUT 14. SLEW RATE														
	UNITS	v/v	mc	meg	—	μv/°C	μv/8 hr	pa	pa/°C	μv, pk	mv, pk	± volts	ma	Kc	v/μsec
MODEL															
140	10 ⁶	0.2	0.5	INT	3	35	200	5	100	5	20 / 10	4 / 20	100	12	
140M15	10 ⁶	0.2	0.5	INT	3	35	200	5	100	5	10	20			
140A	10 ⁶	0.2	0.5	INT	3	35	200	5	100	5	20 / 5	4 / 100			
140B	10 ⁷	1	0.5	INT	3	25	30	5	100	0.5	100 / 60	20 / 30	20	12	
141	10 ⁸	1	1	INT	1	10	10	1	40	0.5	20 / 10	4 / 20	125	15	
142	10 ⁸	1	1	INT	1	10	10	1	40	0.5	100	20	25	15	
143	10 ⁸	1	1	INT	1	10	10	1	40	0.5	50	50	50	15	
141C	10 ⁸	1	1	INT	1	10	10	1	50	0.5	20 / 10	4 / 20	125	15	
142C	10 ⁸	1	1	INT	1	10	10	1	50	0.5	100	20	25	15	
143C	10 ⁸	1	1	INT	1	10	10	1	50	0.5	50	50	50	15	

CASE SIZES (Dimensions in inches)

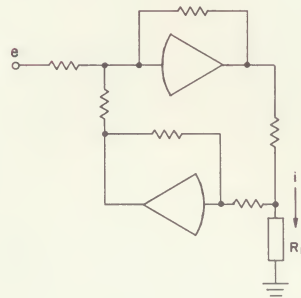


applications

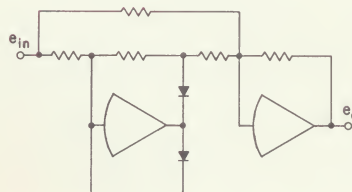
Single ended amplifiers usually employ chopper stabilization for drift correction which results in excellent voltage and current drift and especially fine low frequency performance. Only a few of the more interesting applications are shown below. Now that high speed semiconductor current switches are available and inexpensive, a whole new variety of applications can be performed with fast operational amplifiers.



Differential input, differential output circuit. Design closed loop gain at unity. Very useful high input impedance results from 'bootstrapped' input terminals.

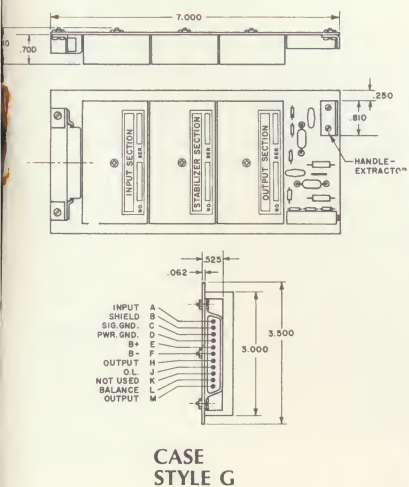


Voltage to current conversion. Current delivered to load is controlled by input signal. With loop gain set precisely at unity, effective output impedance becomes bootstrapped to infinity. ma/volt scaling accomplished by changing input resistor to maintain unity loop gain.



Absolute value circuit. Uses precision rectifier and summer for single polarity output and equal gain for both polarity input signals. Negative signal gain can be different from positive input signal gain.

15. SUPPLY VOLTAGE	16. QUIESCENT CURRENT	17. TEMPERATURE RANGE, Operating	18. CASE TYPE	19. PRICES
volts	ma	°C		\$ (1-9)
24	15	0 to 60	D	90
15	15	0 to 60	D	90
24	15	0 to 60	D	118
125	20	0 to 60	E	135
24	15	0 to 60	F	170
125	25	0 to 60	F	185
75	25	0 to 60	F	195
24	15	-25 to +85	G	190
125	25	-25 to +85	G	220
75	25	-25 to +85	G	230



CASE STYLE D Glass epoxy etched circuit card measuring 3 by 5 inches. Plugs into 15 pin Viking VK15S/1-2 connector (supplied).

CASE STYLE E Glass epoxy etched circuit card measuring 3.5 by 7 inches. Input stages covered with electrostatic shield. Mates with 15 pin Viking VK15S/1-2 connector (supplied).

CASE STYLE F Glass epoxy card measuring 3.5 by 7 inches. Mates with 15 pin Viking VK15S/1-2 connector (supplied). Protective module covers are bolted to card to relieve stress on solder connections.

CASE STYLE G Ruggedized glass epoxy card with Winchester connector bolted directly to card. Mating connector supplied. Recommended for MIL environmental requirements.

DIFFERENTIAL AMPLIFIERS

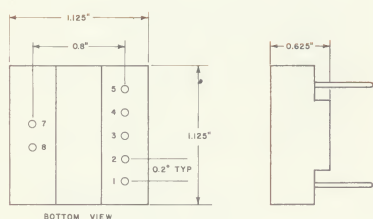
a word about the ZELTEX differentials...

The differential operational amplifiers tabulated below are of two types: (1) small encapsulated modules which employ matched input stages (either regular transistors or FET's) for drift cancellation, and (2) the larger and more sophisticated units using solid state choppers.

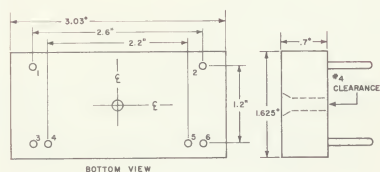
The small module types are relatively inexpensive and exhibit lower values of high frequency noise due to absence of the 4 kcs chopper spikes. The chopper stabilized differentials have excellent voltage and current offset and temperature drift in addition to very high input impedance. Both types have been supplied against severe environmental requirements.

CHARACTERISTICS (@ 25° C unless noted)	1. OPEN LOOP GAIN AT D.C.															
	2. GAIN BANDWIDTH PRODUCT (at unity gain) (Differential)															
UNITS	3. INPUT IMPEDANCE (at D.C.) (Common Mode)															
	4. OFFSET VOLTAGE ADJUSTMENT															
MODEL	5. INPUT VOLTAGE DRIFT vs TEMP.															
	6. INPUT VOLTAGE DRIFT vs TIME (Constant Temp.)															
UNITS	7. INPUT OFFSET CURRENT															
	8. INPUT CURRENT DRIFT vs TEMP.															
UNITS	9. COMMON MODE VOLTAGE, MAX.															
	10. INPUT NOISE, NARROW BAND (2 cps to 50 cps)															
UNITS	11. INPUT NOISE, WIDE BAND (2 cps to 1 mc)															
	12. OUTPUT VOLTAGE															
UNITS	13. OUTPUT CURRENT															
	14. FREQUENCY FOR FULL OUTPUT															
UNITS	15. SLEW RATE															
115	50,000	2	0.1	10	EXT	50	50	500	5	10		25 μ v	10	4	150	10
115B	20,000	2	0.1	10	EXT	50	50	500	5	10		25 μ v	10	4	10	0.6
131	100,000	1	3,000	3,000	INT	20	50	1	0.1	7		50 μ v	10	4	80	5
111	10 ⁶	0.2	0.1	50,000	INT	5	15	0.1	0.05	200	15	0.5 mv	20 / 10	4 / 20	3	0.4
112	10 ⁶	0.2	0.1	50,000	INT	5	15	0.1	0.05	200	15	0.5 mv	100	20	1	0.6
113	10 ⁶	0.2	0.1	50,000	INT	5	15	0.1	0.05	200	15	0.5 mv	50	50	2	0.6
111S	10 ⁶	0.14	0.1	50,000	INT	5	15	0.1	0.05	200	25	1 mv	20 / 10	4 / 20	3	0.4
112S	10 ⁶	0.14	0.1	50,000	INT	5	15	0.1	0.05	200	25	1 mv	100	20	1	0.6
113S	10 ⁶	0.14	0.1	50,000	INT	5	15	0.1	0.05	200	25	1 mv	50	50	2	0.6

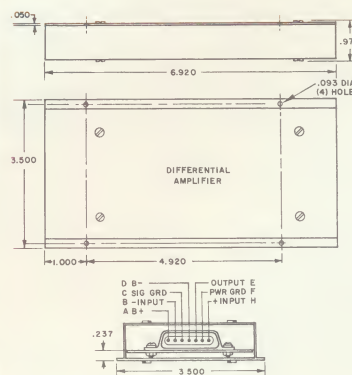
CASE SIZES (Dimensions in inches)



CASE
STYLE A



CASE
STYLE B



CASE
STYLE C

CASE
STYLE A

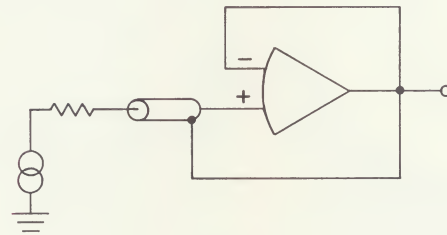
CASE
STYLE B

CASE
STYLE C

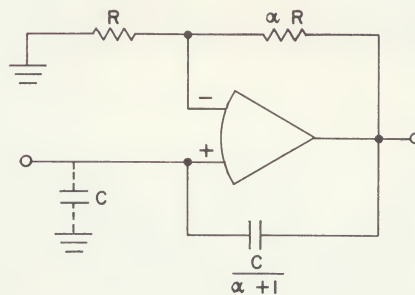
applications

Differential operational amplifiers are extremely versatile devices. They can be used as conventional single ended units by grounding the $+$ input terminal or can be used differentially. The number of useful circuits that can be derived with a differential amplifier seems to be limited only by the inventiveness of the applications engineer. Many of the simple and more conventional circuits have been shown elsewhere. A few additional interesting circuits are shown below.

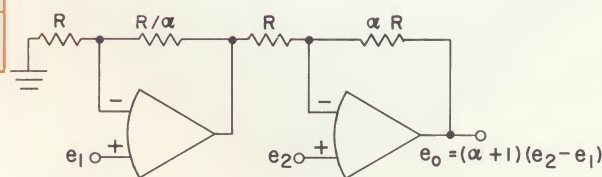
16. SUPPLY VOLTAGE	17. QUIESCENT CURRENT	18. TEMPERATURE RANGE, operating	19. CASE TYPE	20. PRICES
$\pm$ volts	ma	$^{\circ}\text{C}$		\$ (1-9)
15	4	-25 to +85	A	50
15	4	-25 to +85	A	33
15	7	0 to +60	B	125
24	15	0 to +60	C	225
125	20	0 to +60	C	295
75	25	0 to +60	C	295
24	15	-25 to +85	C	300
125	20	-25 to +85	C	380
75	25	-25 to +85	C	380



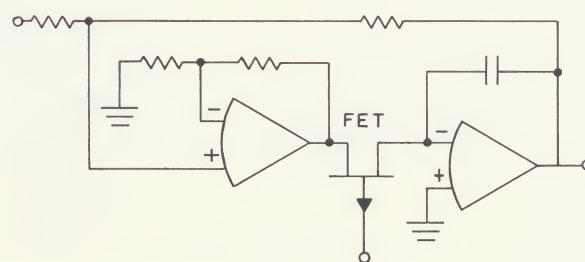
Called a positive follower. Provides a positive gain equal to $+(1 + 1/A)$ with input impedance very large and equal to $Z_{\text{common mode}}$. Since output is equal to input, it can be used to drive input coaxial shield to eliminate capacitive loading effects.



When connecting an amplifier for $+$ gain greater than one, it may be desirable to cancel the effects of stray capacity with positive feedback as shown.



This circuit provides a simple way to achieve differential amplification with two very high impedance input terminals. CMR can be optimized at DC by adjusting the resistor, R/α .



Track and hold circuit. Driver amplifier rapidly charges integrating capacitor through FET switch. Second amplifier can be FET Model 131 for minimum integrator drift during hold cycle.

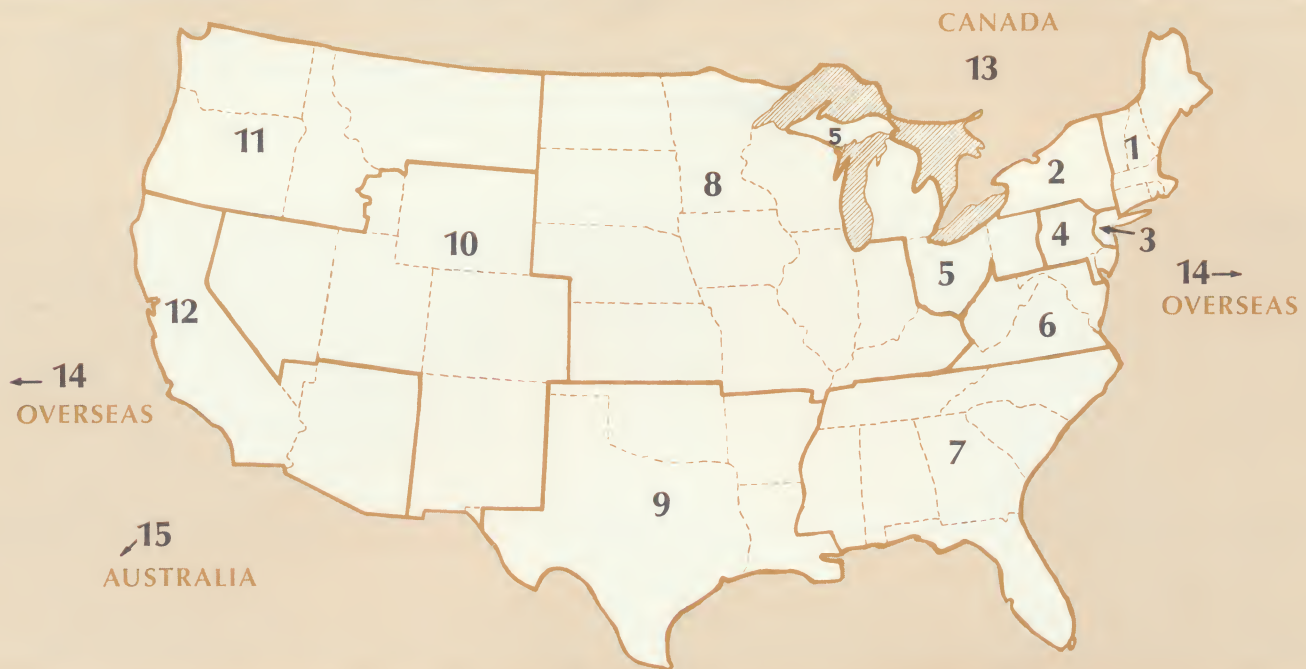
Small encapsulated module. Machined connecting pins facilitate etched circuit card mounting. Base step permits cleaning of contamination on card near pins. For minimum volume, step can be removed. Volume: 0.8 in³. Weight: 0.8 oz.

Encapsulated module with internal offset adjustment. Module can be fixed to card with 4-40 bolt through brass sleeve embedded in module center. Volume: 3.4 in³. Weight: 1.6 oz.

Circuit card is bolted to base plate and protected with metal cover. Amplifier can be bolted to gusset or mounted with nylon slides. Rugged mating Winchester NAS 714-7 connector supplied with amplifier. Weight: 11 oz.

ZELTEX Representatives

The Zeltex Representative organization includes offices throughout the United States, Canada and overseas. These men have been carefully selected for their engineering skill and product knowledge so that they can truly be of service to you. Why not call your nearest Zeltex Representative and discuss your particular applications problem?



1. J & J ASSOCIATES

Waltham, Massachusetts
241 Crescent Street
Phone: (617) 899-0160
Milford, Connecticut
Phone: (203) 878-5891

2. DOOLITTLE ELECTRONICS CORP.

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P. O. Box 97
Phone: (315) 637-3222
Rochester, New York, 14623
516 Hollybrook Road
Phone: (716) 271-2800

3. HARVEY J. KRASNER ASSOCIATES

Great Neck, New York, 11021
33 Great Neck Road
Phone: (516) 487-0690

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Philadelphia, Pennsylvania
P. O. Box 11599
Phone: (215) OR 6-2525

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8701 Fenkell Avenue
Phone: (313) 834-9211
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1954 N. Main Street
Phone: (513) 277-3822

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2218 Briarlea Road
Phone: (919) 274-2570
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1108 Meyer
Phone: (713) HA 4-3155
Dallas, Texas, 75206
4515 Prentice Street
Phone: (214) 363-6324

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Phone: (505) 268-6421
Englewood, Colorado, 80110
3385 South Bannock
Phone: (303) 789-9592

11. AW ELECTRONICS

Seattle, Washington
74 S. Lucille Street
Phone: (206) 725-7664

12. WIELER & COMPANY

Downey, California
10842 So. Paramount Blvd.
Phone: (213) 773-5982
(213) 861-9223
Los Altos, California
One First Street
Phone: (415) 948-7472
Arizona
Enterprise 365

13. ELECTRONETIC SYSTEMS, LTD.

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2171 Avenue Road, Suite 102
Phone: (416) 487-1523
Montreal 26, Quebec
6420 Victoria Ave., Suite 17
Phone: (514) 737-2747

14. CONTROLS AND INSTRUMENTS

New York, New York 10016
15 E. 40th Street
Phone: (212) MU 5-5178-9

15. NEOTRONIC INSTRUMENTS

Carlton, Victoria
62 Queensberry Street



ZELTEX, INC.

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- ☐ please have a Zeltex representative call

my phone number is: _____

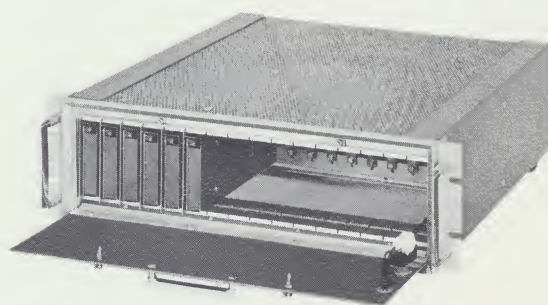
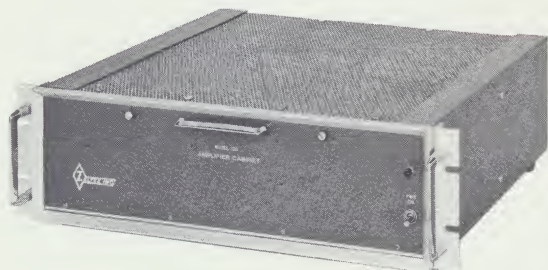
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COMMENTS

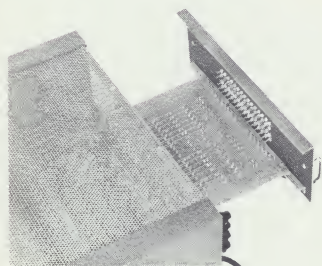
AMPLIFIER ACCESSORIES 100 SERIES



ZELTEX, INC.

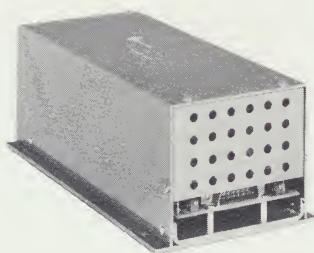


Front view, 120 Series Cabinetry.



Component Tray
slides into rear
of cabinet.

Model 101 Power
Supply (identical in
size to Models 102
and 103)



• CABINETRY

The 120 series cabinets are designed to rack mount up to 15 amplifiers in a panel space of 5 1/4 by 19 inches. An internal supply is pre-wired to all connectors and provides all power required by the amplifiers. The hinged front panel supports the power switch and light, and the fuses and power cord are located at the cabinet rear. All cabinets are supplied with one Component Tray which plugs into the rear of the Cabinet and provides a convenient place to mount input and feedback components. The standoff solder terminals automatically connect to the amplifier signal leads when the tray is inserted into the cabinet, and external connection to the components and signal leads can be made in one of two ways; where direct connection is preferred, the feed through solder terminals shown are supplied on the rear panel of the Component Tray. Alternately, the Component Tray is provided with two 26 pin connectors on the rear panel at no extra charge.

Model 120-0 Cabinet. Without power supply. Connectors pre-wired for Differential Amplifiers, Models 111, 112, 113 and silicon counterparts. \$295.00

Model 120-1 Cabinet. With power supply and connectors for Models 111 and 111S. \$610.00

Model 120-2 Cabinet. With power supply and connectors for Models 112 and 112S. \$710.00

Model 120-3 Cabinet. With power supply and connectors for Models 113 and 113S. \$710.00

Model 120-4 Cabinet. With power supply and connectors for Model 141. \$610.00

Model 120-5 Cabinet. With power supply and connectors for Model 142. \$710.00

(Additional Component Trays @ \$70)

• POWER SUPPLIES

Model 100 Power Supply. $\pm 24v$ @ 200 ma. Dual regulation. 3 1/2 by 7 inches by 2 inches high. \$250.00

Model 101 Power Supply. $\pm 125v$ @ 250 ma. Dual regulation. 5 1/4 by 9 1/2 inches by 4 1/4 inches high. \$350.00

Model 102 Power Supply. $\pm 75v$ @ 400 ma dual regulated. 5 1/4 by 9 1/2 inches by 4 1/4 inches high. \$350.00

Model 103 Power Supply. 24v @ 600 ma dual regulated. 5 1/4 by 9 1/2 inches by 4 1/4 inches high. \$350.00

• MISCELLANEOUS

Model 120A Extender Card is an etched circuit card with connectors at both ends that slides into the 120 series Cabinetry and supports the amplifier outside the cabinet to permit servicing. The Model 120A uses 9 pin Winchester connectors and is for the Models 111, 112, 113 and silicon versions of the Differential Amplifiers. \$30.00

Model 120C Extender Card is similar to the Model 120A except

that it uses 15 pin connectors. For amplifier Models 140, 141 and 142. \$30.00.

Model 120D Component Card uses the same 15 pin connector and is the same size as the Model 141 and 142 amplifier. It is an etched circuit card which contains a group of standoff solder terminals which can support input and feedback components. \$30.00.

2350 Willow Pass Road / Concord, California / Phone 686-6660, Area Code 415